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SECTION 6: ESTIMATED COSTS AND SCREENING-LEVEL ECONOMIC AND SOCIAL IMPACTS

This section presents a summary of the estimated costs of the tier scenarios and the results of using these cost estimates in two economic impact analyses: a regional economic impact analysis performed by EPA's National Center for Environmental Economics, and a first cut at a screening-level analyses of potential for substantial and widespread impacts at the local level. The regional analysis provides estimates of the economic effects that expenditures on pollution controls will have on the economy as a whole. For example, just as there are cost impacts for those who must pay for nutrient and sediment control actions, there are sectors of the economy that will benefit from implementing such actions. The screening-level analyses examine the potential for impacts at the county level. The term "screening" is used here to make the very important distinction that this economic information IS NOT an actual social and economic analysis to determine whether substantial and widespread social and economic impacts may occur. Rather it is a screening level analysis that can be used to show where substantial and widespread social and economic impacts are unlikely and, conversely, highlight areas where more comprehensive analyses need to be focused. This information can also be used to assist the jurisdictions in determining where and how much public financial assistance would be most beneficial.

6.1   BACKGROUND

Information on estimates of costs (Section 6.2) and screening level analyses of economic and social impacts (Section 6.4) are based on the implementation of nutrient and sediment reduction actions described by the tiers (See Section 5 for a description of the BMPs and control technologies defined by each nutrient and sediment reduction tier). Factor 6 of Section 131.10(g) states that a current designated use can be changed if it can be shown that "controls more stringent than those required by sections 301(b)(1)(A) and (B) and 306 of the Act would result in substantial and widespread economic and social impact." It is important to note that the analyses presented in this TSD did not need to rely on this factor to show why the current designated aquatic life protection uses in the Bay are not attainable and need to be changed. Sufficient justification is provided by relying only on factors 1) naturally occurring pollutant concentrations prevent the attainment of the use, and 3) human caused conditions that are irretrievable (see Section 3). Yet, it stands to reason that if the use removal factors are used to downgrade a current use, then these factors can be used equally effectively to determine just what is the best refined aquatic life use attainable. Additionally, the jurisdictions may choose to use information on the economic impacts for determining the attainability of the refined uses. This TSD is not making conclusions on attainability of the new and refined uses based on the substantial and widespread social and economic information, but is providing the jurisdictions with some screening level information to assist them in doing so.

EPA solicits public comment on the methodology and results of the cost and economic screening analyses presented below.

To provide information on social and economic impacts, costs of nutrient and sediment reduction practices necessary to meet the new and refined uses must be determined. Appendix E presents the results of a comprehensive Bay Program effort to collect information on, and estimate where otherwise unavailable, the cost of the nutrient and sediment reduction actions represented by the tiers. It is important for the reader to understand that the costs presented herein are only three example levels (based on technologies in Tiers 1, 2 and 3), of what could be an infinite number of combinations of reduction actions. Because the tiers were developed based on technology, and not on cost effectiveness, the Bay Program believes that these costs provide a near worst case scenario of what the total costs might actually be to meet the DO criteria. (Note that sediment-related BMPs to meet the water clarity criteria for Bay grass protection are still being evaluated and are not yet included in the cost estimates.)

During the comment period, and completed by April 2003, a cost-effectiveness analysis will be performed on each BMP and technology represented in the tiers, and possibly, others not included in the tiers, to provide jurisdictions better information on a more cost-effective mix of actions to accomplish a given nutrient or sediment reduction level.

The reader should also note that costs are not provided for the fourth tier, or E3 (described in Section 3) because it was determined by the Bay Program partners that the reduction actions in this scenario were not physically plausible in all cases. (See Attachment 1 to Appendix A).

The Bay Program then developed screening level information on economic impacts based on the costs developed for each tier. This TSD does not attempt to provide conclusions on affordability. This is because 1) the WQSC determined that it did not have a basis for setting thresholds defining "substantial" and "widespread" economic and social impacts Baywide, especially for artificially constructed tiers; and 2) on a regional, state or large watershed scale, economic impacts can be mitigated by cost-share, loans, new federal or state funding programs which preclude making definitive economic conclusions at this basin level. The final socio-economic analysis is best done during the process of establishing tributary strategies. Tributary strategies will be developed by each of the individual Bay jurisdictions in parallel with their nutrient and sediment related water quality standards development process which will be initiated once the EPA criteria guidance is published in April 2003.

However, this TSD provides a broad basin-wide SCREENING economic impact analysis, also based on the tiers, to provide indicator information on ranges of impacts on a county-by-county basis throughout the watershed. The results of the screening analysis provide information on where substantial and widespread impacts are unlikely, and conversely, where it will be necessary to perform further more detailed COMPREHENSIVE economic impact analyses by the jurisdictions when conducting their own individual UAAs to determine specific impacts. Note, that the use boundaries as delineated in this document are preliminary and were not determined using economic impact information. It will be up to the individual jurisdictions, when conducting their own UAAs, to ultimately determine affordability and their final boundary delineations as a result. An example of comprehensive economic impact analyses (or "groundtruthing") is provided in Appendix H of this TSD to assist the jurisdictions in developing a methodology for conducting more in depth economic impact analyses. The results of this

screening level analysis can also be a valuable tool in determining, geographically, where additional funding, possibly in the form of government cost-shares or loans, would be most useful, or in determining the most appropriate level of funding assistance.

Two concerns were raised by the Bay Program partners which are addressed more fully in the Appendixes to this document: 1) The potential social impacts of imposing load allocation caps on wastewater treatment plants as a result of water quality standards eventually imposed by the jurisdictions, and 2) the costs of CSOs. Each jurisdiction, in the development of their water quality standards, and their tributary strategies, will be determining the most appropriate methods and programs to achieve the necessary nutrient and sediment reductions. Concerns have been raised that one such program will be to impose nutrient allocation caps on wastewater treatment plants, and the ramifications of this will promote urban sprawl. Most Bay Program partners contend that urban sprawl is a phenomenon that is occurring now regardless of the nutrient reduction measures that may ultimately be required, that it will not necessarily be affected by POTW caps, and that not all jurisdictions will be imposing such caps. This document lays out the issue in Appendix J so that the jurisdictions know the deliberations the Bay Program partners have had to date on this issue.

CSOs and sanitary sewer overflows (SSOs) are not a part of the tiers used to determine what technologies could be employed to effect nutrient and sediment reductions because they are regulated separately and costs are associated with protection of human health parameters such as fecal coliforms reduction. Costs are also highly variable. Thus, the estimated cost of the tiers does not include costs for control of CSOs and SSOs, nor does the information presented herein on social and economic impacts include these costs. However, it is recognized that, for the areas in the Bay watershed that will be required to implement CSO and SSO measures, the costs for implementing nutrient reduction measures would be an additional burden. While it is not appropriate to include these costs and impacts as part of an analysis that is directly related to nutrient and sediment control, such information will be relevant to the jurisdictions in assessing total costs which certain cities may incur. As an example, Appendix I provides available information on potential CSO costs for three cities and provides a sensitivity analysis of estimated impacts when added to the tiers.

Exhibit 6-1: CSO Controls and Costs

As Appendix I describes, cities in the watershed that have combined sanitary and storm water sewer systems experience CSO events when flows from both sources exceed the system capacity. During CSO events, untreated wastes are directly discharged to receiving waters. EPA developed the CSO Control Policy (published April 19, 1994) to control CSOs through the National Pollutant Discharge Elimination System permitting program. The Policy provides guidance to municipalities and State and Federal permitting authorities on how to meet the CWA's pollution control goals in a flexible and cost-effective manner so as to accommodate a community's financial capability. The Policy requires implementation of minimum technology-based controls (the "nine minimum controls") not expected to require significant engineering studies or major construction by January 1, 1997. Communities with combined sewer systems are also expected to develop long-term control plans (LTCP) that will ultimately provide for full compliance with the CWA, including attainment of water quality standards.

CSO communities are now in various stages of developing and implementing their LTCPs, including characterizing their combined sewer systems, monitoring the impacts of CSOs on waterways, and discussing water quality and CSO control goals with permitting authorities, water quality standards authorities, and rate payers. CSO control costs that are not met by State and Federal grants will be paid by urban residents either in the form of POTW service fees or municipal taxes. For the reasons noted above as well as the uncertainty in what these costs will be, future CSO costs are not included in current (2001–2002) sewer fees analyzed as part of the economic screening analyses provided in Appendix H. Estimated future CSO costs can be added to POTW costs for the tier scenarios to evaluate the sensitivity of the Municipal Preliminary Screener (MPS) value to these costs. As described in Appendix H, the MPS is a preliminary screener value above which a need to perform secondary tests of substantial impact and a widespread analysis is triggered.

Appendix I provides such an analysis of the sensitivity of the MPS for Tier 3 POTW costs to additional CSO costs for three cities: Washington, D.C., Lynchburg, Virginia, and Richmond, Virginia. The results for the District's recommended LTCP (in public comment phase) indicate that, even without any Federal funding, adding the estimated CSO control costs to Tier 3 POTW costs may not trigger the secondary test for substantial impacts (i.e., substantial impacts are unlikely). Note that some portion of the selected alternative may double count storm water control costs included in the Tier 3 scenario. For Lynchburg, the increase in the estimated MPS due to CSO controls triggers the secondary test to determine if there are substantial financial impacts. However, given the terms of the City's CSO consent special order, annual expenditures on CSOs will more likely slow to a rate which reflects a lower MPS. CSO control plans are uncertain for Richmond. The estimated MPS values for three alternatives under review trigger the secondary test. However, the CSO control plan is still in the preliminary phase and will likely be revised before implemented. Also, since the MPS values for Richmond—like those for the District—do not include any funding for CSO control costs, actual impacts may be overstated.

Appendix I also provides a list of all of the CSOs in the Chesapeake Bay watershed and indicates their LTCP status.

6.2   SUMMARY OF ESTIMATED COSTS

The Chesapeake Bay Program's estimated costs of the tier scenarios reflect the costs of BMPs to remove nitrogen and phosphorus; these BMPs also remove sediment to some extent and, therefore, capture a portion of sediment removal costs. Costs for publicly owned treatment works and industrial sources are based on facility-provided estimates; the Bay Program's NRT Task Force developed methodology to estimate the costs of achieving the tier-specific effluent concentrations when facility estimates were not provided.

Costs for urban, agriculture, forestry, and onsite system BMPs are based on the units (e.g., acres) of BMP implementation in each tier scenario, and BMP-specific estimates of capital and operation and maintenance (O&M) costs. The Chesapeake Bay Program performed an extensive literature search that included documents provided or prepared by Chesapeake Bay Program workgroups and stakeholders (e.g., tributary strategy reports), academic journals, studies by University Extension offices, the U.S. Department of Agriculture, the U.S. EPA, and others to estimate such costs. In addition, to estimate the costs for the onsite system denitrification BMP, the Chesapeake Bay Program collected data from manufacturers of onsite system denitrification technology. Of the available data on cost estimates, the Chesapeake Bay Program prioritized well-documented sources and studies in or near the Chesapeake Bay watershed. In general, the Chesapeake Bay Program used a simple average of the estimated costs from appropriate sources.

The costs to implement the tier scenarios include capital costs to install controls and annual operating and maintenance costs. Appendix E provides details of the methods and results of the cost analyses, including estimates of the total annual cost of achieving the tier scenarios, total capital cost requirements, and, to the extent that information is available, estimates of how costs may be shared between the public and private sectors. The total annual costs shown here include annualized capital costs for control technologies or BMPs that require initial capital expenditures and annual O&M expenditures, regardless of whether costs accrue to private-sector businesses and households or public entities that provide funding through cost-share programs. The estimates represent the annual costs at full implementation of the tier scenarios. Therefore, actual annual costs in the years prior to meeting the full implementation goals will likely be lower.

Total capital costs represent total initial expenditures for all source controls. Capital costs indicate overall financing requirements to achieve the level of control or degree of BMP implementation specified for each tier. The costs, however, will not be incurred in any single year. Instead, they will be spread over many years though gradual implementation.

The distinction between private and public cost estimates is based on cost-share assumptions developed using current cost-share information for the agricultural and POTW sectors to project the share of future costs accruing to the public sector. The cost share assumptions vary according to individual state programs. There are no cost-share assumptions for urban BMPs although retrofit BMPs for developed areas may receive substantial support from Federal and State sources. They may also benefit greatly from "piggy back" opportunities that reduce incremental

BMP costs to a fraction of the unit costs because BMPs can be added more cost-effectively to planned infrastructure upgrades, repairs, or investments.

Exhibit 6-2 provides a summary of cumulative costs for each tier. These are costs beyond what has already been expended up to the year 2000 (and already funded POTW upgrades). It is important to note that some portion of Tier 2 and 3 costs will be incurred regardless of tier implementation because of baseline requirements that are not fully captured in the Tier 1 scenario (e.g., livestock BMPs required in a forthcoming Federal rule). Finally, the costs include those paid by businesses and households in the watershed as well as costs paid through Federal and State cost-share programs.

Exhibit 6-2: Summary of Total Annual Cumulative Costs
(in 2001 dollars)

Cost Category	Tier 1 (cost of current programs funded to 2010)[1]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1+ Tier 2 + Tier 3)
Total Annual Costs ($millions)[2]	$196	$552	$1,124
Implied Cost per Household (before cost share)[3] ($)	$31	$88	$178
Implied Household Cost (before cost share) as Percent of Median Household Income in the Watershed ($49,300)	0.1%	0.2%	0.4%
Federal and State Funding Share (%)	26%	34%	28%

 1. POTW NRT upgrades already funded or completed are not included in Tier 1.
 2. Includes costs paid by Federal and State cost-share programs.
 3. Actual household costs will vary by location and type of household (e.g., urban or farm) and will be reduced by the Federal and State funding shares. The impact analysis addresses these distributional effects.

Exhibit 6-2 also shows the implied average annual costs for each of the projected 6.3 million households by 2010, if all costs were paid by households living in the watershed (in reality, household costs will vary by location and household type, and a substantial share will be paid by Federal and State sources). These estimates show that the tier scenario costs are negligible compared to Bureau of Labor Statistics (2002) estimates of the average U.S. household expenditures in 2000 on eating away from home ($2,137) and entertainment ($1,863). Indeed, they are even less than average expenditures on nonalcoholic beverages ($250, excluding dairy products) and alcoholic beverages ($372). Furthermore, the cost estimates are small relative to total household expenditures of $2,489 on household utility services, which includes $877 for telephone services, $1,315 for energy services, and $296 for water and waste services.

Similarly, these annual costs are small compared to median household incomes in the watershed. The median estimate for the counties in the watershed is $49,300. This estimate is in 2001 dollars and reflects incomes in the 2000 Census of Population. Average median incomes across

the states range from $37,800 for the basin counties in New York to $58,300 for the basin counties in Maryland.

The average cost for households in the watershed will be lower than the estimates in Exhibit 6-2 because Federal and State cost-share programs provide financial support for nutrient controls. Based on current practices, these programs could provide up to $51 million of annual Tier 1 costs (or 26%), $187 million of annual Tier 2 costs (or 34%), and $311 million of annual Tier 3 costs (or 28%). The total cost-share contribution increases from Tier 1 to Tier 2 because agricultural costs increase relative to other sectors, and most agricultural BMPs are covered by cost-share programs. The total cost-share contribution declines from Tier 2 to Tier 3 as urban costs, for which Federal and State funding is possible but not included, increasingly dominate total costs. Average cost per household will also decrease if actual implementation of controls is more cost effective than the tier scenarios.

A breakdown of costs by State in **Exhibit 6-3** show that three states—Maryland, Pennsylvania, and Virginia—account for almost 90% of costs across all three tier scenarios. Maryland has the largest share of annual Tier 1 costs, followed by Virginia and Pennsylvania. However, Virginia has the highest share of Tier 2 and Tier 3 costs, followed by Pennsylvania and Maryland. Maryland's shift from highest baseline costs to third highest Tier 2 and Tier 3 costs illustrates its aggressive level of implementation already employed or planned.

Exhibit 6-3: Summary of Total Annual Cumulative Costs by Jurisdiction[1]
(millions of 2001 dollars)

Jurisdiction	Tier 1 (cost of current programs funded to 2010)[2]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
Delaware	$3	$8	$13
District of Columbia	$0	$8	$27
Maryland	$65	$123	$250
New York	$7	$31	$66
Pennsylvania	$51	$168	$320
Virginia	$61	$195	$411
West Virginia	$7	$19	$37
Total	$196	$552	$1,124

Detail may not add to total due to rounding.
1. Includes costs paid by Federal and State cost-share programs.
2. POTW NRT upgrades already funded or completed are not included.

The cumulative cost estimates shown in Exhibits 6-2 and 6-3 do not reflect the incremental costs of implementing controls beyond Tier 1 levels (or baseline levels that are essentially what would happen anyway). The incremental costs for Tiers 2 and 3 can be derived by subtracting the Tier 1

costs from the cumulative Tier 2 and 3 costs, respectively. (The revised final draft report may portray costs in this incremental manner, since it better reflects the cost of the tier scenarios beyond a baseline that would occur anyway, although even some portion of the incremental costs will be required under existing regulations regardless of tier implementation.)

Corresponding total capital costs are $1.4 billion for Tier 1, $3.6 billion for Tier 2, and $7.6 billion for Tier 3. These estimates include anticipated Federal and State cost shares. These costs will be incurred slowly over time as controls are gradually implemented. Nevertheless, comparing them to annual economic statistics provides crucial perspective because—despite their magnitude—they are small compared to total annual personal income, which in 1999 was $574 billion in the watershed counties and $1.4 trillion in the basin states (BEA, 2001).

State-level capital costs shown in **Exhibit 6-4** also include the portion that will be funded through Federal and State cost-share programs as well as costs that will be paid by households in the watershed. The distribution of capital costs follows the same pattern as annual costs in Exhibit 6-3. Maryland, Pennsylvania, and Virginia account for approximately 90% of watershed costs across all tier scenarios. Maryland costs are highest in Tier 1, followed by Virginia and Pennsylvania. Tier 2 and Tier 3 capital costs in Virginia are highest, followed by Pennsylvania and Maryland.

Exhibit 6-4: Summary of Total Cumulative Capital Costs

Jurisdiction	Total Capital Cost (millions of 2001 dollars)[1]			Annual Total Personal Income in Watershed for 1999 (millions of 2001 dollars)[3]
	Tier 1 (cost of current programs funded to 2010)[2]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)	
Delaware	$21	$36	$60	$24,600
District of Columbia	$3	$40	$192	$21,600
Maryland	$621	$889	$1,866	$178,800
New York	$20	$175	$405	$47,400
Pennsylvania	$258	$901	$1,944	$134,700
Virginia	$426	$1,425	$2,934	$197,400
West Virginia	$35	$119	$236	$5,600
Total	$1,385	$3,551	$7,636	$610,000

Detail may not add to totals due to rounding.
1. Includes capital costs paid by Federal and State cost-share programs.
2. POTW NRT upgrades already funded or completed are not included in Tier 1.
3. Total personal income in 1999 (BEA, 2001) in the counties located partially or wholly in the watershed. Values have been inflated to 2001 dollars using the Consumer Price Index.

For comparison purposes, Exhibit 6-4 also provides the 1999 estimates of total annual personal income for the watershed counties. Total capital costs for Tier 1 equal less than 0.5% of regional income in all States except West Virginia, where cost equals 0.7% of total personal income. Thus, even if all capital costs were paid in a single year, instead of being spread over 10 to 20 years through gradual implementation and financing, they would be small compared to local economic activity. Total capital costs for Tier 2 equal less than 1% of regional income in all States except West Virginia, where costs are 2.1% of income. Tier 3 costs equal less than 1% of income for Delaware, New York, and the District of Columbia. Capital costs equal less than 1.5% of income in Maryland, Pennsylvania and Virginia, and less than 5% in West Virginia.

These costs do not include the costs of onsite waste management systems (e.g., septic systems) in new homes because the additional expense associated with denitrification, rather than appearing as a distinct cost, will be absorbed in the cost of a new home and the impact would, therefore, be limited to tradeoffs in what a homeowner can buy for the same price (e.g., changes in other materials or features in the home).

Exhibit 6-5 shows the breakdown of total annual costs and total capital costs by sector. In both instances, costs include private costs paid by households in the watershed and public costs that will be paid for by Federal and State cost-share programs. State-level breakdowns are shown in the sector-specific sections below.

Exhibit 6-5: Total Annual and Capital Costs by Sector[1]
(millions of 2001 dollars)

Sector	Total Annual Cumulative Cost			Total Capital Cumulative Cost		
	Tier 1 (cost of current programs funded to 2010)[2]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)	Tier 1 (cost of current programs funded to 2010)[2]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
POTW	$51	$146	$271	$598	$1,557	$2,748
Industrial Sources	$0	$8	$15	$0	$51	$98
Agriculture	$61	$226	$376	$312	$850	$1,490
Forestry	$23	$27	$31	$0	$0	$0
Urban	$60	$146	$418	$475	$1,128	$3,233
OSWMS	$0	$0	$13	$0	$0	$68
Total	$196	$552	$1,124	$1,385	$3,856	$7,636

Detail may not add to total due to rounding.
1. Includes costs paid by Federal and State cost-share programs.
2. POTW NRT upgrades already funded or completed are not included in Tier 1.

With respect to annual costs, the agriculture and urban sectors account for the highest share of Tier 1 costs, followed by POTW costs. In Tier 2, agricultural costs dominate total costs (41%) followed by urban costs (26%), but the urban sector has the highest cost share in Tier 3 (37%) followed by agricultural costs (33%).

The distribution of capital costs across sectors differs significantly also. POTW costs account for the largest share of capital costs in Tiers 1 and 2 (43% in both instances), followed by urban and agricultural costs. In Tier 3, urban costs account for the largest share (42%) followed by POTW and agricultural costs. Urban costs in Tier 3 go up significantly due to the amount of storm water retrofits which increase from 5% in Tier 2 to 20% in Tier 3.

6.2.1   POTW and Industrial Source Costs

Costs for NRT among POTW and industrial sources include capital expenditures and annual O&M costs. There are no industrial control costs in Tier 1 because industrial Tier 1 actions are assumed to be those already in place or planned. In Tiers 2 and 3, POTW control costs account for more than 90% of annual NRT costs. Total annual costs of $153 million for Tier 2 include $146 million for POTWs and $8 million for industrial facilities. Similarly, annual Tier 3 costs of $286 million include $271 million for POTWs and $15 million for industrial facilities.

Costs for POTW controls in Tier 1 reflect NRT projects planned for 2010 that are not yet funded. This includes NRT planned for 154 out of the 304 significant POTWs in the Bay watershed; effluent concentrations for these facilities in 2010 should be 8 mg/l TN. (*Nutrient Reduction Technology Cost Estimations for Point Sources in the Chesapeake Bay Watershed*, Chesapeake Bay Program, November 2002). Tier 2 reflects costs to implement NRT in the remaining 150 POTWs and assumes, in general, TN and TP effluent concentrations of 8 and 1 mg/l, respectively. The technologies to achieve this level of reduction include extended aeration trains and denitrification zones for nitrogen removal and chemical addition systems for phosphorus removal systems. Tier 3 reflects costs of technologies necessary to implement NRT in all of the POTWs to effluent concentrations of 5 and 0.5 mg/l TN and TP respectively. The technologies to achieve this level of reduction include the addition of a secondary anoxic zone plus methanol addition, and additional clarification tankage for nitrogen removal and additional of chemicals for phosphorus removal. (Note that limits of technology for point sources for nutrient removal are considered to be 3 and 0.1 mg/l TN and TP, respectively). The technologies to achieve this level of reduction include deep bed denitrification for nitrogen removal and microfiltration for phosphorus removal. However, the E3 scenario, which includes limits of technologies is not included as part of this TSD, yet, point source costs for the E3 level can be found in the above reference).

Exhibit 6-6 shows annual POTW costs by tier scenario and jurisdiction. Similar to annual costs for all sectors, these results show the largest share of Tier 1 costs occur in Maryland and the largest share of Tier 2 and Tier 3 costs occur in Virginia and Pennsylvania. These results show how planned (Tier 1) NRT implementation costs vary across these states. Maryland is planning expenditures of $31.8 million annually under Tier 1, which accounts for almost 83% of cumulative costs under Tier 2 and 44% of cumulative costs under Tier 3. In contrast, Pennsylvania's Tier 1 costs are $6.5 million, which accounts for 20% of cumulative Tier 2 costs and 11% of cumulative Tier 3 costs. Virginia's Tier 1 costs are $12.7 million, which equals 21% of cumulative Tier 2 costs and 12% of Tier 3 costs.

Exhibit 6-6: Summary of Total Annual Cumulative POTW Costs[1]
(millions of 2001 dollars)

Jurisdiction	Tier 1 (cost of current programs funded to 2010)[2]	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
Delaware	$0.2	$0.6	$0.8
District of Columbia	$0.0	$5.8	$18.8
Maryland	$31.8	$38.4	$72.4
New York	$0.0	$6.2	$10.2
Pennsylvania	$6.5	$32.0	$60.3
Virginia	$12.7	$60.8	$105.6
West Virginia	$0.0	$1.8	$2.6
Total	$51.2	$145.7	$270.7

Detail may not add to total because of independent rounding.

1. Includes Federal and State cost shares equal to 10% of capital costs for VA, 50% of capital costs for MD, and 0% for remaining jurisdictions.

2. POTW NRT upgrades already funded or completed are not included.

Total capital costs for POTWs and industrial dischargers are $0.6 billion for Tier 1, $1.6 billion for Tier 2, and $2.8 billion for Tier 3. This includes costs paid by households in the watershed as well as costs paid by Federal and State cost-share programs. Similar to annual costs, POTWs accounts for more than 90% of these costs in each tier. The distribution of capital costs across states also mimics the distribution of annual costs shown in Exhibit 6-6.

6.2.2   Agriculture Costs

Exhibit 6-7 provides a summary of total annual costs, including those paid by farmers and those paid by cost-share programs. Based on current implementation shares, the cost-share programs would account for approximately 75% of annual costs in Tiers 2 and 3; farmers would incur the remaining 25% of annual costs. Cost-share programs account for a smaller share of annual Tier 1 costs (60%) because BMPs with lower cost-shares such as animal waste management systems account for a larger portion of annual costs.

Exhibit 6-7: Summary of Total Annual Cumulative Agricultural Costs[1]
(millions of 2001 dollars)

Jurisdiction	Tier 1 (cost of current programs funded to 2010)	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
Delaware	$2.2	$6.3	$9.4
District of Columbia	$0.0	$0.0	$0.0
Maryland	$8.3	$33.8	$49.6
New York	$1.8	$14.7	$28.3
Pennsylvania	$22.2	$90.9	$146.6
Virginia	$21.6	$67.9	$118.3
West Virginia	$5.1	$12.7	$24.2
Total	$61.2	$226.3	$376.3

Detail may not add to total because of independent rounding.
1. Based on current cost share program information, Federal and state cost-share programs would account for approximately 60% of annual costs in Tier 1 and 75% of costs in Tiers 2 and 3; farmers incur the remaining costs.

Annual costs are highest in Pennsylvania for all tier scenarios. Virginia has the second highest share of costs in all scenarios, followed by Maryland. Together, Pennsylvania and Virginia account for 70% of annual agricultural costs.

Total capital costs in the agricultural sector are $312 million for Tier 1, $850 million for Tier 2, and $1.5 billion for Tier 3. The distribution of capital costs across states is similar to the annual cost distribution shown in Exhibit 6-7.

6.2.3   Forestry Costs

Annual costs to implement forest harvesting BMPs range from $23.5 million in Tier 1 to $30.8 million in Tier 3. Thus, baseline implementation in Tier 1 accounts for most of the costs in this sector. **Exhibit 6-8** provides annual cost estimates by tier scenario. This sector has the smallest share of annual costs in all tier scenarios because implementation acre estimates are small. All costs are annual because practices are assumed to be implemented on different harvest acres each year.

Exhibit 6-8: Summary of Annual Forest Harvest Costs by Tier and Jurisdiction (millions of 2001 dollars)

Jurisdiction	Tier 1 (cost of current programs funded to 2010)	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
Delaware	<$0.1	<$0.1	$0.1
District of Columbia	$0.0	$0.0	$0.0
Maryland	$1.6	$1.8	$2.0
New York	$3.6	$4.1	$4.5
Pennsylvania	$13.9	$15.6	$17.4
Virginia	$3.0	$4.1	$5.1
West Virginia	$1.3	$1.5	$1.7
Total	$23.5	$27.1	$30.8

Note: Detail may not equal total due to rounding.

6.2.4   Urban Costs

Exhibit 6-9 provides annual costs by tier and jurisdiction for urban areas. These costs are for storm water BMPs and exclude POTW costs. Tier 1 costs are highest in Maryland and Virginia, with each accounting for 40% of annual Tier 1 costs. Maryland's share of costs declines in Tier 2 (32%) and Tier 3 (29%) while shares for other states, except Delaware, increase across the scenarios. This is indicative of Maryland's higher baseline BMP implementation rate compared to most other states. Virginia's share of total annual costs is 41% for Tiers 2 and 3. Pennsylvania's share of total annual costs increases from 15% in Tier 1 to 21% in Tier 3.

Storm water retrofits account for over 90% of annual urban costs in all tier scenarios. Although the total number of retrofit acres is small (e.g., less than 0.4% of watershed acres in Tier 2 and 1.8% in Tier 3), the per-acre cost is high compared to other sectors. Nevertheless, the average cost per household for the 4.9 million urban households in the watershed by 2010 is expected to be small, ranging from $12 in Tier 1 to $85 in Tier 3. These estimates assume that all costs are borne by urban households. However, Federal and State cost share funds or other cost-saving opportunities might reduce these costs.

**Exhibit 6-9: Summary of Cumulative Annual Urban Costs by Tier and Jurisdiction
(millions of 2001 dollars)**

Jurisdiction	Tier 1 (cost of current programs funded to 2010)	Tier 2 (Tier 1 + Tier 2)	Tier 3 (Tier 1 + Tier 2 + Tier 3)
Delaware	$0.5	$1.0	$2.4
District of Columbia	$0.3	$2.1	$8.3
Maryland	$23.8	$47.3	$119.5
New York	$1.7	$6.4	$21.6
Pennsylvania	$8.8	$27.0	$87.7
Virginia	$24.1	$59.3	$170.5
West Virginia	$0.9	$2.5	$7.5
Total	$60.2	$145.5	$417.6

Note: Detail may not add to total due to rounding.

Total capital costs are $0.5 billion for Tier 1, $1.1 billion for Tier 2 and $3.2 billion for Tier 3.
The distribution of capital costs across states is similar to the distribution of annual costs shown
in Exhibit 6-9.

6.2.5   Onsite Waste Management System Costs (Septic Systems)

There are no onsite waste management system (OSWMS) costs for Tiers 1 and 2. This is
because no existing onsite systems require an upgrade to a septic system with an advanced
nitrogen removal capability in these two tier scenarios. Costs are minimal for Tier 3 because, as
specified in this tier, only 1% of existing systems require upgrades or replacement. The annual
cost for Tier 3 is $13 million and total capital costs equal $68 million. The average annual cost
per household implementing the BMP is $1,020.

As noted above, this estimate does not include costs for new homes. The estimated annual cost
for new homes is not included because: 1) developers have an opportunity to offset incremental
OSWMS costs with savings in other construction costs, and 2) costs would be absorbed into the
price of a new home mortgage. Furthermore, the per-system cost of $1,020 used in the cost
analysis is for single system upgrades, whereas new homes built in developments will most likely
have lower costs because they can use multi-home systems with lower average per-home costs.

6.2.6   Air Deposition Reduction Costs

Costs have not been estimated for the air emission reductions presented in the tiers. The
Chesapeake Bay Program is in the process of developing the information necessary to estimate
costs in addition to determining what parts of the tiers should be included in the effort.

Certainly, because Tiers 1 and 2 for air emissions reflect regulations required under the CAA, it is questionable whether or not these costs should be presented as necessary to meet the new designated uses for the nutrient and sediment water quality criteria. Costs for Tier 3, which involve voluntary actions beyond the CAA may be more appropriate to present as actions specifically due to Bay restoration. *EPA solicits comment on the appropriateness of including air emission reduction costs that would be implemented in response to the CAA in the costs estimates necessary to remove the nutrient and sediment related impairments to restore the Chesapeake Bay.*

6.3   REGIONAL ECONOMIC IMPACTS ANALYSES (DISTRIBUTIONAL EFFECTS)

At the request of the Chesapeake Bay Program, EPA's National Center for Environmental Economics (NCEE) evaluated the socioeconomic impact of attaining revised water quality criteria, designated uses, and boundaries for the Chesapeake Bay and its tidal waters. The objective of this analysis is to estimate the economic impacts of both the direct and indirect effects of compliance. Measures of economic impacts include changes in the value of regional output, or goods produced, employment, as well as wages and income. This, as mentioned below in Section 6.4, is a measure of widespread socioeconomic impacts. Below is a brief overview of the results of this analysis, with additional quantitative results provided in Appendix G.

Given the size of the regional economy ($1.4 trillion in personal income in 1999 in the six-State area and the District of Columbia, including $573 billion in Bay counties), net impacts over this area are not likely to be seen. For example, baseline gross regional product in the State of Maryland is forecast to grow by 37% by 2010, corresponding to 19% growth in employment and 17% growth in real disposable personal income. The Tier 3 scenario would result in a net increase in output, employment, and value added above baseline levels. The stimulus results from increased spending in high wage industries (e.g., wastewater treatment technologies) as well as an influx of funds for pollution controls (e.g., Federal cost shares for agricultural BMPs). Not included are additional market benefits likely to result from improved water quality (e.g., commercial and recreational fishing industries). Therefore, the regional economy should expand as a result of the tier scenarios.

The estimated annual cost of Tier 3 for 2010 populations ($1.2 billion in 2001 dollars) represents 0.2% of personal income in the Bay counties in 1999. Even if all capital costs ($7.6 billion) for this scenario were incurred in one year, they represent only 1.3% of personal income in the Bay counties in 1999. Although these data indicate that the pollution controls specified in the tier scenarios will not result in substantial and widespread social and economic hardship, there may be localized areas that need funding priority or special considerations.

6.4   SUMMARY OF SCREENING-LEVEL IMPACT ANALYSIS

EPA (1995) guidance requires **multiple** analyses to determine whether costs to meet water quality standards will have a substantial financial impact on those responsible for paying the costs **and** a widespread social and economic impact on the community. The guidance recommends several tests to determine if compliance costs might have a substantial financial

impact. For the widespread impact analysis, macroeconomic modeling is the best approach because it can show how incremental costs affect the sectors implementing controls and the sectors that receive revenues as a result of the expenditures. U.S. EPA conducted a macroeconomic analysis at a regional level for the UAA Workgroup. The results, as described above, indicate positive net impacts on regional output and employment. This happens because the expenditures occur in sectors that have higher regional output multipliers and employment-to-output ratios compared to the sectors incurring costs. In addition, the costs are small compared to the size of the regional economy ($1.4 trillion in personal income in 1999 in the six-State area and the District of Columbia, including $573 million in Bay counties). This result illustrates the importance of considering the full range of economic impacts rather than focusing only on costs. It also shows that control costs may not have substantial **and** widespread adverse social and economic impacts at the watershed level.

Nevertheless, there may be localized areas that need funding priority. Not only would conducting a complete substantial and widespread impact analysis for each of the 197 counties and independent cities in the watershed be time consuming and costly, but premature due to the fact that the tiers are hypothetical constructs rather that actual programs developed by the jurisdictions in their tributary strategies. Therefore, the UAA Workgroup developed a screening analysis to identify where county-level costs or economic conditions are not likely to meet EPA's criteria for substantial and widespread social and economic impacts. These areas could be excluded from further analysis, focusing attention on evaluating costs in the remaining areas to determine whether they cause substantial and widespread impacts in the local area.

The twelve sector-related screening variables selected by the UAA Workgroup include:

- C   Agriculture: Average BMP costs/net cash return
- C   Agriculture: Crop plus portion of hay BMP costs/crop plus hay sales
- C   Agriculture: Livestock plus portion of hay BMP costs/livestock sales
- C   Agriculture: Average BMP costs/median household income
- C   Agriculture: Percent of county earnings from agriculture, agriculture services, food and kindred products, and tobacco sectors/total county earnings
- C   Forestry: Percent of county earning from forestry and logging/total county earnings
- C   Urban: Average BMP costs/median household income
- C   Onsite Treatment Systems: Average BMP costs/median household income
- C   Onsite Treatment Systems: Percent of households affected in county
- C   POTWs: Current household sewer rate plus average new household cost/median household income
- C   POTWs and Urban Combined: Total sewer costs (current plus new) plus average urban BMP cost/median household income
- C   Industrial: Percent of county earnings from industrial sectors containing affected facilities/total county earnings.

The screening model variables for some sectors indicate when control costs are small relative to household incomes and, therefore, unlikely to meet EPA conditions for substantial impacts. Variables for other sectors indicate whether they are small relative to the local economy and, therefore, unlikely to meet EPA conditions for widespread impacts. **Exhibit 6-10** provides a summary of the variables, as well as EPA (1995) guidance for conducting analyses of substantial and widespread impact from water quality standards. *EPA solicits public comment on the economic screening analysis methodology and screening variables.*

Exhibit 6-10. Summary of Private and Public Sector Tests for Substantial and Widespread Impacts and the Screening Variables Constructed for the Tier Scenarios

Sector	EPA (1995) Tests		Screening Variables for the Tier Scenarios[1]	
	Substantial	**Widespread**	**Substantial**	**Widespread**
POTWs (public)	Verify project costs. Two-part test consisting of: 1. MPS Screener[2] and, if MPS greater than 1%, 2. Secondary Test (consisting of scores for six indicators: a. bond rating b. net debt/full market value of taxable property c. comparison of unemployment rate to national average d. comparison of MHI to national average e. property tax revenues/full market value of taxable property f. property tax collection rate) with 1& 2 scored jointly.	Estimated change from precompliance conditions in socioeconomic indicators (MHI, unemployment rate, overall net debt/full market value of taxable property, percent households below poverty line, impact on community development potential, impact on property values).	Screening-level MPS[2] (e.g., calculated assuming 100% of flow is residential, no funding sources in several states).	None
Industrial (private)	Verify project costs. Primary Measure: Impact of Project Costs on Profit. Secondary Measures: Liquidity, Solvency, Leverage.	Impact on affected community (comparison of unemployment rate to national average, unemployment rate in community after compliance, MHI, percent of households below poverty line, change in expenditures on social services in affected community, percent of tax revenues paid by affected entity, State unemployment rate after compliance, change in State expenditures on social services).	None	Earnings from discharger category (at 2-digit SIC level) as percent of total earnings.

Exhibit 6-10. Summary of Private and Public Sector Tests for Substantial and Widespread Impacts and the Screening Variables Constructed for the Tier Scenarios

Sector	EPA (1995) Tests		Screening Variables for the Tier Scenarios[1]	
	Substantial	**Widespread**	**Substantial**	**Widespread**
Forestry (private)	Verify project costs. Primary Measure: Impact of Project Costs on Profit. Secondary Measures: Liquidity, Solvency, Leverage.	Impact on affected community (comparison of unemployment rate to national average, unemployment rate in community after compliance, MHI, percent of households below poverty line, change in expenditures on social services in affected community, percent of tax revenues paid by affected entity, State unemployment rate after compliance, change in State expenditures on social services).	None	Earnings from forestry and logging as percent of total earnings.
Agriculture (private)	Verify project costs. Primary Measure: Impact of Project Costs on Profit. Secondary Measures: Liquidity, Solvency, Leverage.	Impact on affected community (comparison of unemployment rate to national average, unemployment rate in community after compliance, MHI, percent of households below poverty line, change in expenditures on social services in affected community, percent of tax revenues paid by affected entity, State unemployment rate after compliance, change in State expenditures on social services).	Screening level estimates of: 1. Average BMP costs/NCR 2. Crop plus portion of hay BMP costs/crop plus hay sales 3. Livestock plus portion of hay BMP costs/livestock sales 4. Average BMP costs/MHI.	Earnings from agriculture, agriculture services, food and kindred products, and tobacco sectors as percent of total earnings.
Urban (public)	Verify project costs. Two-part test consisting of: 1. MPS Screener[2] and, if MPS greater than 1%, 2. Secondary Test (consisting of scores for six indicators: a. bond rating b. net debt/full market value of taxable property c. comparison of unemployment rate to national average d. comparison of MHI to national average e. property tax revenues/full market value of taxable property f. property tax collection rate) with 1& 2 scored jointly.	Estimated change from precompliance conditions in socioeconomic indicators (MHI, unemployment rate, overall net debt/full market value of taxable property, percent households below poverty line, impact on community development potential, impact on property values).	Screening-level MPS[2] (e.g., calculated assuming no funding assistance).	None

Exhibit 6-10. Summary of Private and Public Sector Tests for Substantial and Widespread Impacts and the Screening Variables Constructed for the Tier Scenarios

| Sector | EPA (1995) Tests | | Screening Variables for the Tier Scenarios[1] | |
	Substantial	Widespread	Substantial	Widespread
Onsite (public)	Not specific (household waste management systems not funded by municipalities).	Not specific (household waste management systems not funded by municipalities).	Screening-level MPS (e.g., calculated assuming no financial assistance).	Percent of households affected.
POTW plus urban (public)	Verify project costs. Two-part test consisting of: 1. MPS Screener[2] and, if MPS greater than 1%, 2. Secondary Test (consisting of scores for six indicators: a. bond rating b. net debt/full market value of taxable property c. comparison of unemployment rate to national average d. comparison of MHI to national average e. property tax revenues/full market value of taxable property f. property tax collection rate) with 1& 2 scored jointly.	Estimated change from precompliance conditions in socioeconomic indicators (MHI, unemployment rate, overall net debt/full market value of taxable property, percent households below poverty line, impact on community development potential, impact on property values).	Screening-level MPS[2] (e.g., calculated assuming 100% of flow is residential, no funding sources for POTW projects in several states, and no funding assistance for urban BMPS).	None

BMP = Best management practices.
MHI = Median household income.
MPS = Municipal Preliminary Screener (defined as incremental household control costs plus existing household sewer rate divided by median household income).
MHI = Median household income.
NCR = net cash return.
1. County-level variables. See the appendix for calculation of the screening variables.
2. Defined as total annual sewer rate (current rate plus new costs per household) divided by MHI.

Appendix H provides detailed results from the screening analysis. The summary below shows that most counties are unlikely to meet one impact condition or the other as a result of implementing the tier scenarios and, therefore, are unlikely to have substantial **and** widespread impacts. Screening analysis results for the remaining counties, however, do not imply that there will be substantial and/or widespread impacts. They only mean that the possibility cannot be ruled out by the screening analysis. A complete substantial and widespread analysis following EPA (1995) guidance must be conducted by the individual jurisdictions as part of their water quality standards development process before making a determination. This is important to remember, particularly with respect to the information in Appendix H on variable values throughout the watershed by county. This information does not indicate where substantial and widespread impacts will occur. Instead, the information indicates only where the screening

analysis cannot rule out the possibility of substantial and widespread impacts on the basis of variable values, and where cost-share assistance may be most useful in a tier scenario.

It is important to note that this screening analysis does not provide conclusions about threshold values beyond which a more comprehensive analysis to determine substantial and widespread impacts should be performed. Rather, the screening results only show the ranges of impacts, and it is left up to the jurisdictions, when evaluating this information, to determine for themselves, what screening value shows the likelihood for impacts, and therefore, where more comprehensive analyses should be focused. In order to summarize the information in this section, data is provided below using certain reference points (such as ratios of costs to median household income of greater than 1%, or sector-level earnings greater than 5% of total earnings, for example). Appendix H, however, provides more detail of exactly what the results are for each county for each variable.

6.4.1   POTW and Industrial Sources

Exhibit 6-11 shows the results of the screening analysis for the POTW sector, and lists the number of counties or independent cities with screening variables that exceed 1% as a result of costs that would be imposed under Tiers 2 and 3. For the POTW sector, the screening analysis consists of comparing total potential sewer bills to median household income. Based on EPA (1995) guidance, substantial impacts are unlikely when this ratio is less than 1%. The results in Exhibit 6-11 (counties with ratios of cost to income above 1%) are insufficient to demonstrate substantial and widespread impacts. They only indicate counties and cities where the possibility of meeting EPA impact criteria could not be ruled out at the screening level. A complete impact analysis would consist of secondary tests of substantial impact and evaluation of whether any substantial impacts would also cause widespread adverse impacts to the community (U.S. EPA, 1995). As stated earlier, CSO and SSO costs are not included in this analysis.

Overall, variable values greater than 1% account for 15% of counties and cities under Tier 2, and 20% under Tier 3. Virginia has the largest number of counties, followed by Pennsylvania. These states also have the largest number of counties or independent cities in the analysis and, therefore, having the greatest number of counties with variable values above 1% is not necessarily indicative of having a high potential for impacts. In fact, the incidence of variable values exceeding 1% is greater in Delaware (1 out of 3 counties) and West Virginia (3 or 4 out of 11 counties) than either Virginia or Pennsylvania.

These results reflect capital cost-share provisions of 10% in Virginia and 50% in Maryland, which reduces the amount of costs borne by households in these States. (No grant funds are assumed for other States or the District of Columbia.) This approach is consistent with EPA (1995) guidance, which require that sources of funding (e.g., Federal and State grants and cost-share funds) be considered in making a determination of substantial and widespread impacts.

Exhibit 6-11: POTW Screening Analysis Results for Cumulative Costs

Jurisdiction (# Counties in Watershed)	Number of Counties with POTW Variable > 1%	
	Tier 2	Tier 3
Delaware (3 of 3)	1	1
District of Columbia (1 of 1)	0	0
Maryland (24 of 24)	2	3
New York (19 of 62)	1	1
Pennsylvania (42 of 67)	5	8
Virginia (97 of 135)[2]	18	22
West Virginia (11 of 55)	3	4
Total (197)	30	39

1. The POTW variable is average cost per household divided by median household income. The average cost includes current household sewer fees plus incremental average household control costs for the tier scenario. Does not include CSO/SSO costs.
2. Includes independent cities as well as counties.

Industrial point sources incur control costs under Tiers 2 and 3. For the industrial sector, tests of substantial impact involve industry specific data that would be time consuming to collect. Therefore, the potential for widespread impacts is used to screen counties for further evaluation based on the relative earnings derived from the industrial sector or sectors in which the point sources are classified. **Exhibit 6-12** lists the number of counties or independent cities by state for which the screening variable value exceeds 5%. The remaining jurisdictions have variable values of less than 5% (and generally less than 1%) except for 10 counties for which the variable cannot be evaluated because of missing data. An analysis of substantial and widespread impacts would be needed only for these 10 jurisdictions, as well as for those with the larger shares of earnings from the sector with an affected discharger. Such an analysis would consist of evaluating the financial impacts on the discharger and, if determined to be substantial, whether there would also be widespread adverse impacts to the community (U.S. EPA, 1995).

6.4.2   Agriculture

The screening analysis includes both a cost variable (to screen on potential for substantial impacts) and an earnings variable for the agricultural sector that is similar to the earnings variable for industrial sources (to screen on potential for widespread impacts). The cost variable compares (implied) average annual per-farm BMP costs to median household income. Because the screening analysis includes two variables, the results in **Exhibit 6-13** reflect the joint outcome of both variables. This is consistent with the need to meet both the substantial and widespread criteria established by EPA.

Exhibit 6-12: Industrial Screening Analysis Results for Cumulative Costs

Jurisdiction (# Counties in Watershed)	Number of Counties with Industrial Screening Variable > 5%[1]
Delaware (3 of 3)	0
District of Columbia (1 of 1)	0
Maryland (24 of 24)	2
New York (19 of 62)	0
Pennsylvania (42 of 67)	4
Virginia (97 of 135)[2]	5
West Virginia (11 of 55)	0
Total (197)	11

1. The industrial screening variable is earnings in the affected sectors divided by total earnings. Results exclude 10 counties with missing earnings data for a sector that includes a substantial discharger; 1 county is in Maryland, 3 are in Pennsylvania, 1 are in West Virginia, and 5 counties are in Virginia.
2. Includes independent cities as well as counties.

Exhibit 6-13: Agriculture Screening Analysis Results for Cumulative Costs

Jurisdiction (# Counties in Watershed)	Number of Counties with MHI Screening Variable > 1% and Farm and Related Earnings Screening Variable > 5%[1]		Number of Counties with MHI Screening Variable > 1% and Farm Only Earnings Screening Variable > 5%[1]	
	Tier 2	Tier 3	Tier 2	Tier 3
Delaware (3 of 3)	1	1	0	0
District of Columbia (1 of 1)	0	0	0	0
Maryland (24 of 24)	1	1	0	0
New York (19 of 62)	2	2	0	0
Pennsylvania (42 of 67)	8	8	0	0
Virginia (97 of 135)[2]	9	10	5	5
West Virginia (11 of 55)	1	1	1	1
Total (197)	22	23	6	6

1. The MHI screening variable is average BMP cost per farm household divided by median household income. Note that this variable represents a mix of private sector and public sector concepts (i.e., business-related expenses compared to household income), and may be difficult to interpret. The earnings screening variable is earnings in farm and related sectors divided by total earnings in the first set of results and farm income only in the second set of results. The related sectors include farm services, tobacco products, and food and kindred products manufacturing.
2. Includes independent cities as well as counties.

Note, however, that the household cost variable is not based on EPA (1995) guidance. EPA (1995) provides profitability tests for businesses. However, the agricultural industry as a whole is highly subsidized, which means that these sources are not typical private businesses, and EPA guidance for evaluating private sector business impacts may not be appropriate. Many agricultural producers do not meet the profitability requirement in EPA guidance (private sector entities must be profitable before implementing pollution controls in order for substantial impacts to result from such costs). However, data are not available to exclude individual unprofitable farms from the analysis. At the same time, the agricultural sector is not similar to municipalities, and so the public sector tests in EPA (1995) also do not apply. For this analysis, costs are also compared to household income as an addition to the private sector screening variables that compare costs to net cash return and sales. However, interpretation of this mix of concepts is difficult (i.e., there is no benchmark for comparing business-related expenses to household income).

Further, there is great uncertainty in the extent of costs that will actually be borne by farmers. The 2002 Farm Bill increases Federal overall conservation funding by 80% above the level committed by the last (1996) farm bill. In addition, the new law permits a greater percentage of BMP installation costs (90%, up from 75% in the 1996 bill) to be granted to limited-resource farmers under the Environmental Quality Incentives Program. The 2002 Farm Bill cost share provisions are not reflected in this economic analysis. Therefore, costs paid by farmers may be lower than those used in the screening analysis, and impacts may be overstated. As one example, although specific provisions for the yield reserve BMP in the tier scenarios are not included in the bill, the program may be funded under an innovative technologies clause of the bill (personal communication with T. Simpson, Chair, Chesapeake Bay Program Nutrient Subcommittee, May 2002). If implemented, this cost-share program could result in annual incentive payments of $20 to $40 per acre that are not included in the screening analysis. Funding for this program alone would reduce the agricultural costs borne by farmers in Tier 3 by $17 million to $42 million per year.

Also, due to the large number of programs and sources across States, the cost-share information may be incomplete. The cost-share assumptions in the impact analysis are very complex because they vary by state, program, and BMP. Cost shares may include a variety of contract arrangements including a capital cost share, an annual rental payment, an up-front incentive payment, and an annual maintenance cost. For this analysis, the Chesapeake Bay Program did not factor in the substantial annual rental payments but instead assumed that they would offset any revenue losses resulting from BMP implementation. If instead, rental payments more than offset any losses (e.g., BMPs are implemented on marginal land such that little revenue is lost), the screening analysis may overstate impacts.

As shown in Exhibit 6-13, under Tier 2, there are 22 counties that do not have de minimus MHI and earnings screening variable values. Therefore, the screening analysis shows that approximately 89% of jurisdictions (175/197) are unlikely to meet the substantial and widespread impact conditions in EPA (1995) guidance. This result uses the earnings screening variable for farm income and related sectors. When this variable is limited to farm income only, 97% of jurisdictions are not likely to meet EPA criteria for substantial and widespread impacts; only 5

counties in Virginia and one county in West Virginia have high values for both screening variables.

Under Tier 3, 23 counties have high values for both screening variables. These results are nearly identical to Tier 2 results despite BMP cost increases. This happens because the earnings screening variable is constant across the tier scenarios, and it becomes the binding constraint on the need to show that there may be potential to meet both criteria. Thus, even if higher costs increase the likelihood of substantial impacts in some counties, the farming sector's small contribution to the local economy limits its ability to have a widespread adverse impact measured by impacts on overall county incomes.

Although the screening analysis includes variables designed to address both substantial and widespread impact potential, it does not provide the basis for concluding that there are substantial and widespread impacts. A full analysis that implements EPA (1995) is required.

6.4.3   Forestry

The screening analysis for forestry impacts uses an earnings variable that compares forestry sector earnings to total earnings. No counties or independent cities are expected to meet EPA criteria for substantial and widespread impacts as a result of forestry BMPs because forestry represents a small share (less than 3%) of earnings in all jurisdictions. The small values indicate that the sector is small relative to the county economy and, therefore, a sector-level substantial impact (if any) is unlikely to have widespread ramifications.

6.4.4   Urban

Like the POTW sector, the screening analysis consists of comparing average annual per-household costs to median household income as an indication of potential substantial impacts. The results show that Tier 2 urban BMP costs in nearly all jurisdictions are not likely to cause substantial and widespread impacts. Further analysis is needed in only 8 out of 197 jurisdictions to determine whether EPA (1995) criteria for substantial and widespread impacts are met (**Exhibit 6-14**).

Under Tier 3, more jurisdictions require further analysis to determine whether impacts are substantial and widespread. Nevertheless, 162 out of 197 jurisdictions still have a small screening variable value (i.e., < 1%), despite a substantial increase in annual BMP costs. Whether the 35 jurisdictions with higher values might actually experience substantial and widespread impacts cannot be determined based on the screening analysis. A complete analysis, which would consist of secondary tests of substantial impact, and evaluation of whether any substantial impacts would also cause widespread adverse impacts to the community, must be conducted (U.S. EPA, 1995).

Exhibit 6-14: Urban Screening Analysis Results for Cumulative Costs

Jurisdiction (# Counties in Watershed)	Number of Counties with Urban Screening Variable > 1%[1]	
	Tier 2	Tier 3
Delaware (3 of 3)	0	0
District of Columbia (1 of 1)	0	0
Maryland (24 of 24)	1	1
New York (19 of 62)	0	4
Pennsylvania (42 of 67)	3	9
Virginia (97 of 135)[2]	4	19
West Virginia (11 of 55)	0	2
Total (197)	8	35

1. The urban screening variable is average household BMP costs divided by median household income. Does not include CSO/SSO costs.
2. Includes independent cities as well as counties.

Urban households may incur costs for urban BMPs as well as POTW controls. Under these combined costs, 146 jurisdictions are not likely to meet EPA impact criteria under Tier 2 (**Exhibit 6-15**). The remaining 51 areas with higher variable values for combined costs require further analysis before an economic impact determination is made.

Exhibit 6-15: Urban and POTW Combined Screening Analysis Results for Cumulative Costs

Jurisdiction (# counties in watershed)	Number of Counties with Combined Screening Variable > 1%[1]	
	Tier 2	Tier 3
Delaware (3 of 3)	1	1
District of Columbia (1 of 1)	0	0
Maryland (24 of 24)	5	8
New York (19 of 62)	4	8
Pennsylvania (42 of 67)	13	22
Virginia (97 of 135)[2]	25	32
West Virginia (11 of 55)	3	5
Total (197)	51	76

1. The combined cost screening variable is average urban BMP and POTW costs per household divided by median household income. Does not include CSO/SSO costs.
2. Includes independent cities as well as counties.

Under Tier 3, the screening analysis shows that combined costs in 121 jurisdictions are not likely to meet EPA impact criteria. Further analysis of impacts is needed for the 76 areas that have higher screening variable values. Such an analysis would consist of secondary tests of substantial impact, and evaluation of whether any substantial impacts would also cause widespread adverse impacts to the community. It would also involve establishing that the costly Tier 3 urban retrofits represent the most cost-effective control scenario (U.S. EPA, 1995).

6.4.5   Onsite Waste Management Systems

Similar to the agriculture sector, the screening analysis for OSWMS costs includes both a cost variable (to screen on potential for substantial impacts) and a variable for the percent of households affected (to screen on potential for widespread impacts). The cost variable compares average annual per-household BMP costs to median household income. The screening analysis indicates that no jurisdictions are likely to meet EPA criteria for substantial and widespread impacts because of the onsite waste management BMP. Since so few households (less than 1% of existing onsite systems) are affected by this control, any substantial financial impacts would not be widespread.